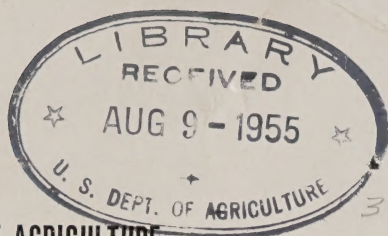


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The Western Pine Beetle

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The western pine beetle (*Dendroctonus brevicornis* Lec.) is the most destructive insect enemy of ponderosa and Coulter pines from southern California north into Oregon, Washington, British Columbia, Idaho, western Montana, and western Nevada (fig. 1). Normally it breeds in a few overmature, slow-growing, decadent, or unhealthy trees, and in wind-falls or trees weakened by drought, stand stagnation, lightning, or fires. Under epidemic conditions it becomes aggressive and kills apparently fast-growing trees of all age and vigor classes that have bark thick enough to protect it in its development.

The heaviest losses of mature merchantable ponderosa pine have resulted from outbreaks of this bark beetle in California, eastern Oregon and Washington, and southern Idaho. Losses as high as 60 to 90 percent of the timber stand in 5 years have been recorded, and many large blocks have been ruined for commercial purposes by its depredations. Estimates place the total loss of ponderosa pine due to this beetle, in the Pacific States, at 25 billion board-feet for the period 1921-45—timber worth more than \$100,000,000 on the stump. It is less important in the more northern limits of its range and at high altitudes.

Host Trees

This native bark beetle confines its attacks to the main trunk of ponderosa pine and Coulter pine. Rarely does it

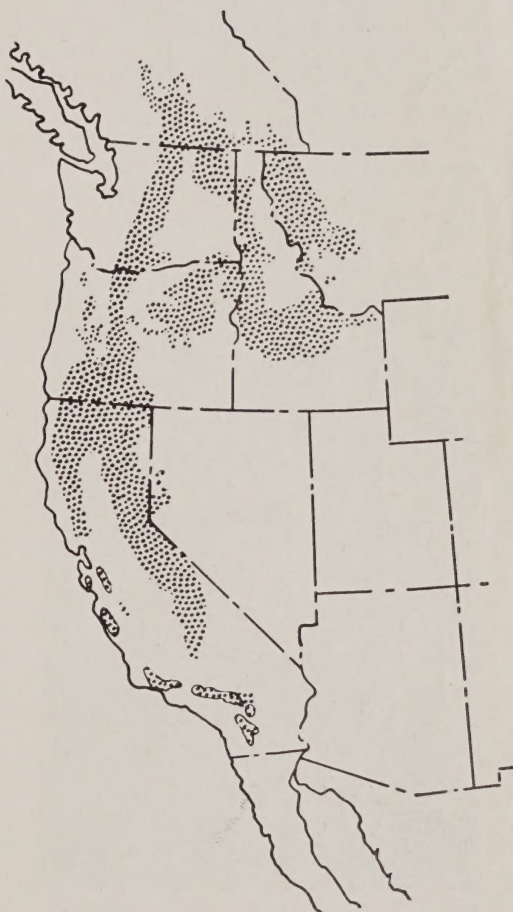


Figure 1.—Distribution of the western pine beetle in the western United States and British Columbia.

go into tops or small trees less than 6 inches in diameter, or into limbs. The beetle may attack other pines under exceptional conditions, but it is unable to breed successfully in such trees.

Evidence of Infestation

A pale color of the needles is usually the first evidence of attack. This faded appearance gradually changes to lemon yellow, then to straw color, sorrel, and red. Close examination of an infested tree shows holes about $\frac{1}{16}$ inch in diameter in the bark and sometimes a small amount of reddish boring dust lodged in crevices of the bark or deposited on the ground around the base of the tree. Usually in these crevices will be found small masses of reddish pitch covering the point of attack (fig. 2). In trees lacking vigor these pitch tubes are very inconspicuous.

The evidence of western pine beetle infestation may be confirmed by removing a section of bark to expose the winding, crisscrossing egg galleries in the

inner bark and the marking of the sapwood (fig. 3). These egg galleries are slightly wider than the adult beetles that construct them and are for the most part tightly packed with boring dust. This peculiar type of egg gallery can be considered as the signature of the western pine beetle if found on ponderosa pine or Coulter pine within its range. Similar patterns are made by



EPQ—8537

Figure 2.—Pitch tube on outer surface of bark, and adult beetle stuck in the pitch.



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Figure 3.—Infested ponderosa pine with bark removed to show scoring of egg galleries on surface of sapwood.

the closely related southwestern pine beetle (*Dendroctonus barberi* Hopk.) in the southern Rocky Mountain region and the southern pine beetle (*D. frontalis* Zimm.) in the Southern States.

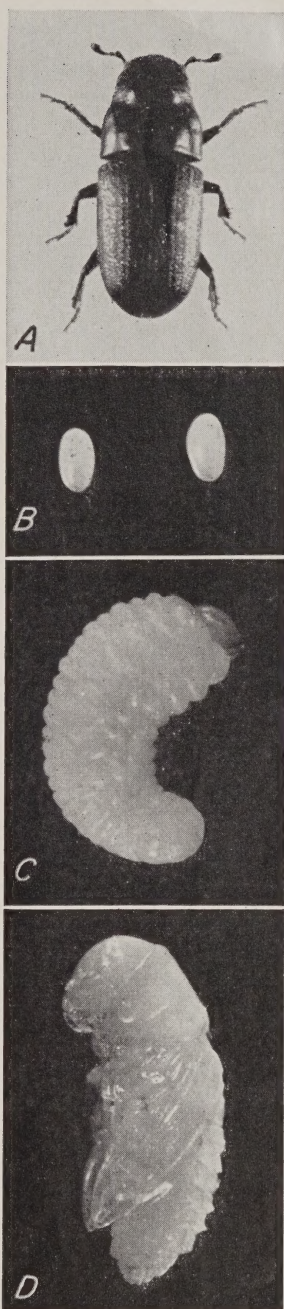
Often infestations of this bark beetle may be detected from abundant woodpecker work on the main bole. When woodpeckers are searching for western pine beetle larvae, they flake off patches of the outer bark and leave the inner bark still adhering to the sapwood. This type of woodpecker work is quite different from the round holes made by the birds when searching for other species of bark beetles or for wood-boring grubs.

Description of Stages

Adult western pine beetles are brown to black, cylindrical, rather stout, hard-shelled, and $\frac{1}{8}$ - to about $\frac{1}{4}$ -inch long (fig. 4, A). Eggs are pearly white, oval, and about half as large as the head of a pin (fig. 4, B). Larvae are white with brown heads, curved, wrinkled, legless, and about $\frac{1}{4}$ -inch long when mature (fig. 4, C). They may be found by slicing halfway through the bark of an infested pine; if the bark is heavily infested, they will appear like so many grains of rice. Between the larval and the adult stages is the pupal or transition stage. Pupae are white and nonfeeding (fig. 4, D). The head, prothorax, wing covers, and other parts of the developing adult show through the pupal case.

What the Beetles Do

Adult beetles fly to a susceptible tree and bore into the inner bark or cambium region, where pairs of beetles drill a network of egg tunnels about $\frac{1}{8}$ -inch in diameter, thus girdling the tree. The beetles entering the bark carry with them a blue-stain fungus, which develops and stops conduction in the sapwood and inner-bark tissues. The female beetles deposit eggs in small niches along the sides of the egg galleries and pack them in with a plug of boring dust. About 12 pairs of parent adults per square foot of bark, or approximately



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Figure 4.—The four stages of the western pine beetle: A, Adult beetle; B, eggs; C, larva; D, pupa. Each 8 times natural size.

6,000 beetles, are required to kill an average-sized ponderosa pine.

In about 7 days the eggs hatch into small larvæ, which feed on the inner bark for about a week and then enter the outer bark, where they grow to full size, pupate, and transform into adults. These emerge individually from the bark, leaving holes that make the bark appear as though peppered with birdshot, and take flight in search of another host tree.

There are usually 2 generations annually in the northern part of the range, and 2 to 3 or sometimes even 4 generations in the southern part, where activity continues almost without interruption throughout the year. In the midrange 2 sets of trees are usually killed annually, 1 during the summer and the other in the fall. The insect overwinters in the fall-killed trees.

What Can Be Done About Them

Natural control.—Woodpeckers and predaceous beetles are important natural enemies of the western pine beetle, though its abundance is more often determined by climatic conditions and the resistance of the host tree. Winter air temperatures of -20° F. and lower for a few days have been found to cause heavy brood mortality. Rapid, vigorous tree growth increases host resistance and discourages epidemics.

Direct control.—Direct measures of control are frequently recommended on recreational areas and on commercial forest areas where it is expected logging will begin within 5 years, particularly when an epidemic is developing. These

measures consist in felling the infested trees and peeling and burning the bark in the fall, winter, or early spring, or in removing the trees from the woods in a salvage operation.

Recently oil sprays containing ethylene dibromide have been used effectively to destroy broods in ponderosa pine in southern Idaho. Five gallons of ethylene dibromide is mixed with 295 gallons of No. 1 fuel oil and sprayed on the infested tree to an 8-inch-diameter top until the bark is thoroughly saturated. Further trials of this method are needed before it can be recommended for general use.

Indirect control.—The most effective method of reducing losses in ponderosa pine stands of the interior is through the removal of susceptible or high-risk trees in a light selective cutting and utilization program known as sanitation-salvage. Susceptible trees can be recognized by their poor vigor; declining growth rate; dying tops and twigs; short, sparse foliage of poor color; and advanced age. Cutting such high-risk trees out of the stand has reduced losses by more than 70 percent for periods of 10 years or more. Such cutting is a form of beetle control through forest management that pays its way. It has largely supplanted direct control methods in commercial stands throughout the interior ponderosa pine forests of northeastern California, eastern Oregon, Washington, and Idaho.

Reference

THE WESTERN PINE BEETLE, A SERIOUS ENEMY OF PONDEROSA PINE. John M. Whiteside. U. S. Dept. Agr. Cir. 864, 11 pp., illus. 1951.